

Assignment #10 (Due: 28-Apr-2021)

A **prime number** (or a **prime**) is a **natural number** greater than 1 that is not a **product** of two smaller natural numbers. A natural number greater than 1 that is not prime is called a composite number. For example, 5 is prime because the only ways of writing it as a product, 1×5 or 5×1 , involve 5 itself. However, 4 is composite because it is a product (2×2) in which both numbers are smaller than 4. Primes are central in **number theory** because of the **fundamental theorem of arithmetic** : every natural number greater than 1 is either a prime itself or can be **factorize** as a product of primes that is unique **up to** their order. (Wikipedia)

Provide Python code snippets for the following:

(a) Write a function **is_prime(n)** that returns True only if n is prime.

(Note that apart from 2 and 3, all primes are of the form $6k \pm 1$ (though not all numbers of the form $6k \pm 1$ are prime of course). Using this, we can improve the computation time by a factor 3. Update your function to use this.)

(b) Write a function that **returns all primes up to n**.

(c) Write a function that **returns the first n primes**.